



INDIAN POULTRY INDUSTRY GLITCHES

Shortcomings and IoT Solutions



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EXECUTIVE SUMMARY

Indian poultry industry is fragmented, with large number of small scale players contributing to the industry. Due to various players, the supply chain tends to be complex and takes longer overhauls and various transit modes before the product reaches the customer. Since the products stay in the transit longer than it should, monitoring and controlling the environmental parameters becomes nearly impossible. Efficiency in the supply chain is drastically affected due to spoilage of eggs and meat during transit. Although fragmentation is highly infeasible, the environmental parameters can be monitored and controlled. Product health monitoring will help the companies regain the lost or unattained efficiency to improve the supply chain performance. This whitepaper deals about the process, problems and the solutions which will put an end to the spoilage of products.

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INTRODUCTION

India is now the world's third largest egg producer after China and USA with 50000 million eggs worth USD 9.8 Billion. India stands fourth position (after China, USA and Brazil) in broiler meat production with 2.25 million tonnes which contributes USD 14 Billion to the national economy. Poultry sector accounts

for about 1 percent of the India's GDP and 10 percent of the livestock GDP. Poultry farming being one of the fastest growing segments of agriculture sector in India with an average growth rate of 6% in egg production and 12% in broiler production per annum.

ENVIRONMENT RELATED PROBLEMS IN THE INDIAN POULTRY INDUSTRY

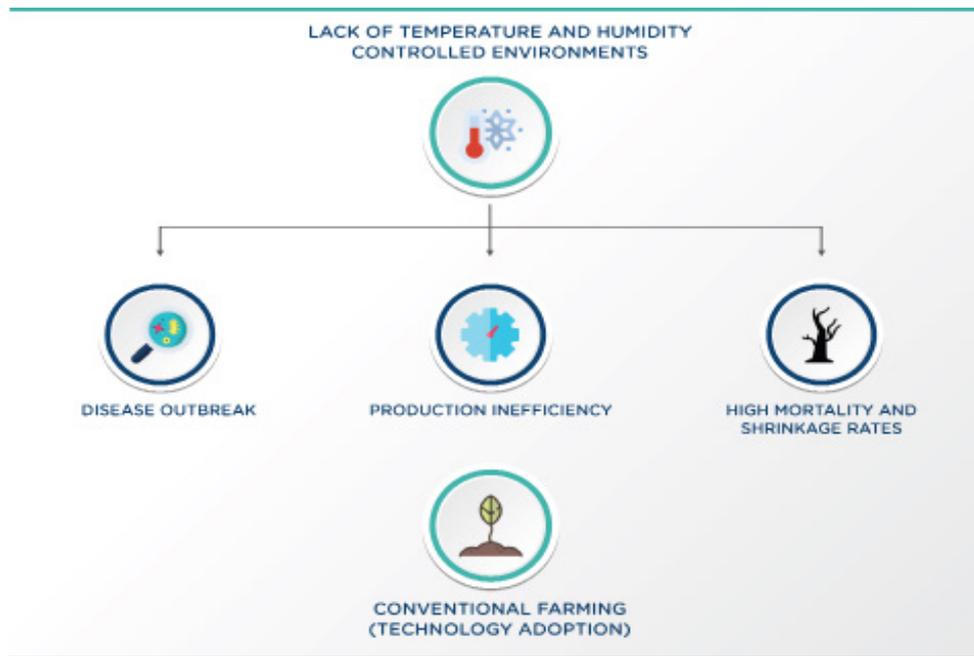


Figure 1. Environment related problems

BROILER AND LAYER FARMING PROBLEMS

Disease outbreaks: The diseases in poultry industry comes in various forms such as bacteria, virus, neoplastic disease, parasites, deficiency and other reasons. Harmful gases and improper maintenance are not the only cause for disease outbreaks. Most of the diseases one way or another are caused by the environmental effects.

Limited Production: Lack of proper controlling of environmental parameters such as temperature, humidity and lightning will restrict the chickens from

growing or laying eggs leading to less production. Manual monitoring incurs a lot of time and money despite the fact that accuracy is not attainable.

Conventional farming: A lot in Indian poultry industry is not automated as it is prevalent in the developed countries. There are many reasons behind the hinderance of automation in the poultry industry. Lack of technology adoption is one of the biggest drawbacks leading to wastage.

HATCHERY PRODUCTION PROBLEMS

Although there are several other problems in the hatchery production, one of the critical problems which the industry faces are temperature and humidity related problems. There are various problems leading to series of consequences from eggs infertility to reduction in the production efficiency. Some of the problems are listed below,

Fertile No Development (FND): These situations arise rarely but happens when the storage room temperature of eggs is too low. If there is an unorganized plan in the hatchery production process, the fertilized eggs have to be kept idle for a long time leading to infertility of the eggs. During receiving and fumigating the eggs, proper washing is required because of the numerous bacteria present in the shell. This again leads to infertility.

Cystic embryo and Blood stream without embryo: When the embryos are stored too long or when the temperature reaches beyond or below the desired temperature range, the embryos stop developing. This can be analyzed only during candling. Since the eggs

are still in the production and candling is done at the later stage, efficient production cannot be obtained. This happens during the first three days of incubation.

High mortality and shrinkage rates: Once the eggs are transferred for heating, the relative humidity is important as the air quality and the moisture content plays a significant role in eggs to chicken hatching ratio. The problems related to temperature and humidity inside the incubation chamber are listed below,

- **Dead embryos before pipping:** This happens when improper temperature is set and there are changes in the relative humidity due to external environmental conditions.
- **Pips stuck to shell and dies:** When there is excessive residual albumen eventually caused by high humidity and temperature variation.
- **Problems of early and late hatching:** Due to temperature and humidity differences, the chicken die of no food with early hatched chicks and the late hatched chicks die of instability.

SOLUTIONS

A NEW PARADIGM FOR POULTRY MONITORING

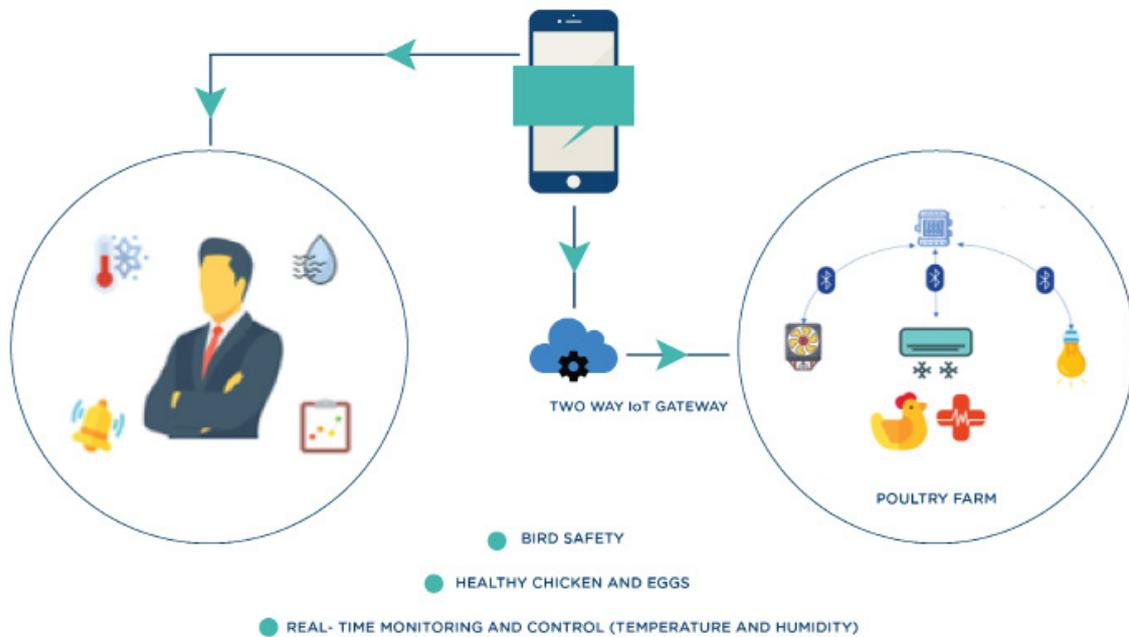


Figure 2. Poultry real time monitoring

All the problems mentioned are pointing to one major problem which is lack of control over the environmental parameters. Monitoring and controlling the environmental parameters will help the poultry industry in both the types of farming and in production process. The problems solved are listed in the below,

Storage room alerts: storage room temperature monitoring is a tedious process as someone has to manually measure and control the temperature and humidity of the room. Lack of temperature and humidity control leads to changing values eventually making the eggs infertile. The asset monitoring devices if kept inside the room, alerts and notifications are sent to the concerned personnel respectively. In this way, employees are aware of the environmental conditions making sure the parameters are under control. It is not just egg storage room but the other places where environmental parameters play a significant role in deciding the production efficiency.

Controlling incubator: Most of the incubators in India are controlled manually for adjusting the temperature and humidity. This makes it tough to control the parameters when an uncertain problem arises. The two-way IoT gateway device paves way for stopping the repercussions on uncertain issues. When the incubator parameters go beyond the required level, the embryos become infertile and the hatchability ratio in the incubator becomes very less.

Reduced candling activities: The result of efficient egg production depends upon the number of infertile eggs obtained during candling. This number can be reduced if the all the previous activities are performed well. In this way, the amount of time spent on candling will be reduced leading to less production time. Cumulative amount of the time saved during candling makes way for increased production.

Chicken uniformity: Transfer to hatching chamber is one of the critical process as uniformity in chicken hatching play an important with the early and late bird situation. Once candling gets over, the undeveloped eggs are put in the incubation chamber again while the fertile eggs are transferred for hatching. If there is a temperature and humidity monitoring or if someone is alerted about the unusual parameter changes then the problem of early and late hatching will be resolved. Higher temperature and humidity leads to early bird hatching while lower temperature leads to late bird hatching leading to death of the early birds. preserved in cold storages while only 12% stay in the transit.

Preventive measures for disease outbreaks: Once the chickens hatch, they are either transported to the broiler or layer farms. Since the chickens start growing

from day 1 inside the farm with a slight difference of process, the care given to the chicks are the same. In that case if a single chick is affected by any disease it spreads to the whole time before any preventive measures are taken. Currently the poultry farms take the diseased chicken out and put them separately. But it is difficult to find the diseased chick at an early stage. The possible solution for this problem is to prevent the disease from attacking the farm. It can be done only by the controlling the environmental parameters which are the main causes for the disease outbreaks. If the environmental parameters are not controlled properly generation of disease is also possible with the less immune chicks and then it is passed on to the entire crowd. The asset monitoring devices helps in monitoring and controlling the temperature and humidity or environmental parameters in general.

CRITICAL PARAMETERS IN THE POULTRY INDUSTRY

Temperature: Temperature plays an important role in the growth cycle of chicken and in the hatchery production process. The birds start to consume more food when they can dissipate more heat out of the body and consume less when their environment is hot and humid. The recommended temperature for broiler and layer farming from 1-14 weeks is 32°C and from 15-80 weeks the temperature should be reduced to a range of 26-30 °C

Lighting: According to poultry hub "Poultry birds are very sensitive to light. Light helps the poultry birds to be productive, finding food and simulating them for reproduction. Besides light, the poultry birds also need dark period for keeping good health and producing melatonin hormone [which is very important for immune function]. Almost all types of poultry birds require 8 hours of darkness period and 16 hours presence of light

Measuring the climatic conditions: Each environmental parameter is measured in a unique way as it requires independent work for monitoring all the parameters. Apart from taking a lot of time and work, cost factor is also a concern. The following are the measurement types for different parameters,

Climate Parameters	Measurement Type
Temperature	Thermometer
Humidity	Psychrometer
Air composition	Gas detector
Lightning and speed	Anemometer

Table 1. Measurement devices

Air composition: Nitrogen, oxygen and carbon-dioxide are the most important elements in air. A proper ventilation is required in the farms to safe guard the

birds from affected by harmful gases. Higher levels of Co2 with high temperature and humidity will lead to suffocation for birds leading them to death. In addition, there are several other gases which affects the birds due to improper maintenance of farm hygiene and the harmful particles present in the air. They are listed below,

Harmful gases	Causes	Consequences
Carbondioxide	Lack of ventilation	Suffocation and death
Ammonia	Manure bacteriological process	Irritates mucous membranes
Hydrogen sulphide	rDecomposition of organic matter	Suffocation and death

Table 2. Effects of harmful gases

Humidity: Poultry hub says "Humidity is controlled by the intense heating or cooling of house air in response to the temperature outside the house. When outside temperatures are low, relative humidity in the house is low, which often results in dry dust circulating in the air within the house. If the relative humidity is too high, this may result in wet litter. The ideal relative humidity for poultry is 60-80%."

Lack of real-time monitoring the climatic conditions is one of the critical cause which leads to disease and death of birds. No effective equipment is used in determining the climatic conditions.

POULTRY FARMING PROCESS IN INDIA

Poultry farming in general is done for production of meat and egg while the by-product being feather production. Egg production is called Layer farming and meat production as Broiler farming. Both the farming techniques are quite different from the operational standpoint. Apart from the production of eggs and meat, hatcheries play a bigger role in turning the eggs to fertile chicks. This paper talks about the various processes involved in the production.

1. Hatchery production:

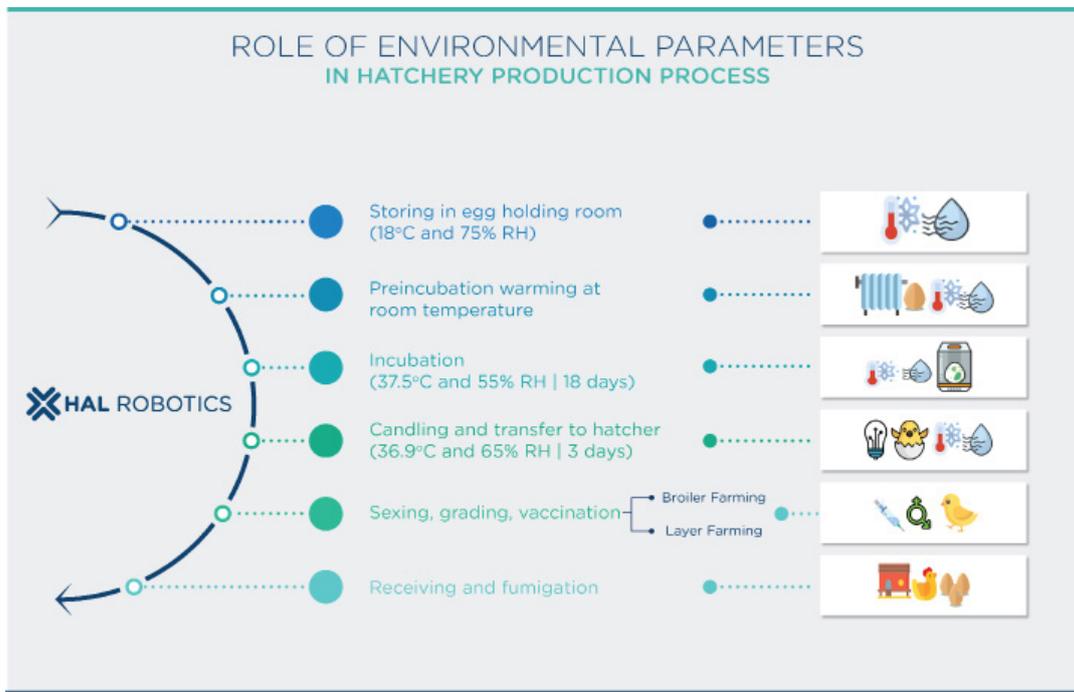


Figure 3. Hatchery production process

Receiving and fumigation: First stage in hatchery production process is receiving the eggs and fumigating them. Fumigating the eggs will kill the germs and bacteria. It is done by immersing the eggs in 3 times concentrated formaldehyde for 20 minutes which kills 99% of germs.

Cold storage room: The fertile eggs then are kept in the cold storage room within a temperature range of 12-18 °C for a maximum of 7 days and the hatchability can also be controlled.

Preincubation warming: Before the eggs are put into incubation chamber, the cold eggs have to be warmed to room temperature to promote sweating. This needs to happen 6 hours prior

to placing the eggs in the incubation chamber.

Incubation: The eggs are put inside the incubation chamber and let the embryo develop until it hatches. Incubation process is divided into two stages. The first stage of incubation is called setting where the eggs are placed on trays and tilted through 90°C on both sides. The temperature, humidity and the presence of gases should be thoroughly monitored for any uncertainty leading to infertility of the eggs. They are not positioned at the same place. The setting stage lasts for 18 days. The second stage is the hatchery stage where the eggs are moved from the setter to the hatchery chamber. The chicks hatch one by one. All the eggs will be hatched by the end of 21st day

Sexing, grading, vaccination: The chicks undergo an observatory examination where the sex is determined and vaccinated before they are transported to the broiler farm or layer farm.

2. LAYER FARMING:

Female chicks from the hatchery unit are brought to the layer farm when they are 4 weeks old. All the chicks before reaching the farm are graded and vaccinated. The chicks are then moved into the growing stage where they are fed with feed containing 15-17% protein content. Chicks need be closed watched as the slight change in the weight will directly affect their egg producing capacity. Vaccination and beak trimming are part of the growing phase as they undergo phase change to egg laying hens. Environmental parameters need to be carefully monitored to prevent uncertain diseases to affect the chicks. The growing stage goes from 4 to 14 weeks before they fully transform into egg laying hens. Adult stage covers the 15-80 weeks old hens where they lay eggs continuously. They should be kept inhouse for the safety of hens and under a temperature range of 26-30°C. Demand fluctuates with every season and hence the supply of eggs should also be properly maintained. The supply of protein content to the hens determines the production of eggs whether the production should be on daily basis. Egg

storing is a significant process in the layer farming. Eggs are collected and then put into egg grader for egg separation. The eggs are stored under the optimal temperature for transportation purpose. The different types of layer farming are free range farming, organic method, yarding method and battery cage method.

3. BROILER FARMING:

Unlike egg laying chicken, the broiler chickens are ready for consumption in 5-6 weeks. From vaccination to feed, the chickens for consumption are given different range of care. Until 1.5 weeks the chicks are given pre-starter feed, from 2-3 weeks finisher feed type is fed. As like layer farming, broiler farming also has different methods of commercial farming. The first stage in the broiler farming is to provide the chicks moved from hatchery to a farm with controlled humidity and temperature. Supplementary heating is provided by gas heaters or gas lamps. The initial air temperature should be from 34°C and gradually reduced to 23°C when the chicks are three weeks old. The birds are ready for harvesting when they are 4 weeks of age and the last harvest can be as long as 8 weeks of age.

CONCLUSION

Poultry farming is growing rapidly in India due to increase in the amount of consumption of meat. With amount of resources in hand, if used productively adopting technology into the poultry world the production number and the quality of the chicken will be increased in the Indian market. While there are numerous diseases attacking the poultry farm and disrupting the production, the environment control measures will help saving the birds by continuous monitoring.

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